

# WHAT IS CLAIMED

1. A network device including slots for a plurality of hot-swappable physical interface cards, the network device comprising:
  - an interface designed to receive the physical interface cards, each physical interface card designed to receive information using at least one of a plurality of physical network interface standards;
  - a plurality of power supply lines for supplying power from the network device to the physical interface card through the interface;
  - an on/off power control circuit connected to the plurality of power supply lines to control power supplied to the power supply lines; and
  - a controller connected to the on/off power control circuit, the controller, in response to detecting the presence of the physical interface card in the interface, instructing the on/off power control circuit to turn on the plurality of power supply lines and to ramp the power supplied to each one of the turned on power supply lines.
2. The network device of claim 1, wherein the controller detects the presence of the physical interface card in the interface by detecting an electrical connection with a predetermined pin in the physical interface card.
3. The network device of claim 2, wherein the predetermined pin in the physical interface card is designed to be the last pin to come into contact with the interface.

Sub A1

Sub #1

4. The network device of claim 1, further comprising:  
a packet I/O manager connected to the physical interface card through a high-speed bus, the packet manager receiving packets of information from the physical interface cards over the high-speed bus.

5. The network device of claim 4, further comprising:  
a memory connected to the packet I/O manager for storing the packets received by the packet I/O manager.

6. The network device of claim 1, further comprising:  
a power monitor circuit connected to the controller and to each of the plurality of power supply lines, the power monitor circuit signaling the controller when the power supplied to each of the power supply lines stabilizes.

7. The network device of claim 1, further comprising:  
a plurality of switches controlled by the on/off power control circuit; and  
a plurality of power supplies, one of the plurality of power supplies being connected to each of the power supply lines through a corresponding one of the plurality of switches.

8. The network device of claim 7, wherein the plurality of power supplies supply at least one of 1.5 volt, 2.5 volt, 3.3 volt, and 5 volt power.

Sub A1

9. The network device of claim 1, wherein the physical interface cards are designed to receive information over at least one of an Ethernet connection, an optical connection over ATM, and an optical connection over SONET.

10. The device of claim 1, wherein the network device is a router.

11. A method of responding to the insertion of an interface card into a packet forwarding engine of a router during run-time operation of the router, the method comprising:

detecting an electrical connection of the interface card to the packet forwarding engine; and

turning on each of a plurality of power lines in the packet forwarding engine that lead to the interface card, each of the plurality of power lines being turned on by ramping a power supply to a predetermined maximum voltage value over a predetermined time period, where larger predetermined maximum voltage values are ramped over a longer predetermined time period.

12. The method of claim 11, wherein the electrical connection of the interface card to the packet forwarding engine is detected by detecting an electrical connection with a predetermined pin in the interface card.

13. The method of claim 12, wherein the predetermined pin in the interface card is designed to be the last pin to come into contact with the router.

Sub A1  
14. The method of claim 11, wherein turning on each of a plurality of power lines includes monitoring each turned-on power supply line for stability.

15. The method of claim 11, further including receiving packets of information from the interface cards over a high-speed bus connected to the packet forwarding engine.

16. The method of claim 11, wherein the interface cards are designed to receive information over at least one of an Ethernet connection, an optical connection over ATM, and an optical connection over SONET.

17. A method of responding to the removal of an interface card from a physical interface of a packet forwarding engine of a router during run-time operation of the router, the method comprising:

detecting, at a controller in the packet forwarding engine, a physical removal of the interface card from the physical interface of the packet forwarding engine;

clearing a data bus connected between the controller and the physical interface;

blocking signals caused by removal of the interface card on control lines between the physical interface and the controller; and

turning off each of a plurality of power lines in the packet forwarding engine that lead to the interface card, each of the plurality of power lines being turned off by ramping down the power supply over a predetermined time period.

Sub A1

18. The method of claim 17, wherein the removal of the electrical connection of the interface card to the packet forwarding engine is detected by detecting an absence of an electrical connection at a predetermined pin in the interface card.

19. The method of claim 18, wherein the predetermined pin in the interface card is designed to be the first pin to break contact with the router.

20. The method of claim 18, wherein the interface cards are designed to receive information over at least one of an Ethernet connection, an optical connection over ATM (asynchronous transfer mode), and an optical connection over SONET.

21. A hot-swappable physical interface card designed to be inserted into a network device comprising:

a first interface to one of a plurality of types of network connections; and

a second interface configured to connect the physical interface card to the network device, the interface including connections for receiving:

a plurality of power supply lines through which power is received from the network device, the network device activating the plurality of power supply lines by ramping the power supplied to each one of the power supply lines in response to the network device detecting insertion of the physical interface card;

a control bus; and

a high-speed data bus for communicating packets of information with the network device.

22. The physical interface card of claim 21, the control bus including connections for receiving:

control lines connected to a controller on the network device, the control lines including a pin detection line, the network device detecting the presence of the physical interface card by detecting an electrical connection through the pin detection line.

23. The physical interface card of claim 21, wherein the pin detection line is the last line in the physical interface card to come into contact with the network device.

24. The physical interface card of claim 21, wherein the physical interface card is designed to receive information over at least one of an Ethernet connection, an optical connection over ATM, and an optical connection over SONET.

25. The physical interface card of claim 21, wherein the power supply lines supply at least one of 1.5 volt, 2.5 volt, 3.3 volt, and 5 volt power to the physical interface card.

26. The physical interface card of claim 21, wherein the pin detection line is the first line in the interface to break contact with the router when the physical interface card is removed from the router.

27. The physical interface card of claim 21, wherein the network device is a network router.